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AUTHOR Dwyer, Carol A.; And Others
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ABSTRACT

The purpose of the study reported in this paper was to examine the effect of visuals possessing different amounts of realistic detail and the effects of integrating covert and overt rehearsal strategies into visually complemented prose instruction. A total of 128 university students participated in the study, which involved a prose text on the human heart in two versions--one complemented with simple line drawings and the other with detailed drawings. After each instructional frame, students were asked to responded covertly (mentally) or overtly (in writing) about whether the drawings in their version correctly illustrated the text. Students then completed four individual criterion tests, including drawing, identification, terminology, comprehension, and a total criterion test. Analyses indicated that significant differences in favor of the covert version of the module containing the simple line drawings existed on the terminology, comprehension and total criterion tests. In comparing the covert and overt treatments complemented by detailed line drawings, the covert treatment was significantly more effective on all criterion measures. The unexpected superiority of the covert responses may have been due to the high academic ability of the participants. When the covert versions were compared, students who received detailed line drawings achieved significantly higher scores on all criterion measures. (Contains 8 references.) (KRN)

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Covert and Overt Rehearsal Strategies Used to Complement Visualization

by
Carol A. Dwyer, Mike Moore, and Francis Dwyer

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Introduction

Research by Dwyer (1978; 1987) has shown that systematically designed and developed visual illustrations properly integrated into traditional instructional sequences are not always a sufficient condition for increasing students' achievement. In many cases, visualization must be used in conjunction with an additional independent variable to optimize information acquisition. Many of these variables are called rehearsal strategies in that they require the student to interact more intensely with the content material, thereby facilitating the movement of information from short-term into long-term memory. This additional rehearsal activity (interaction with the content) encourages the students to think about what they are doing and to encourage their development of relationships among the facts, concepts, procedures, etc. presented in the instruction (Wittrock,1981; Wittrock,,1986; Weinstein & Mayer,1986). Specifically, the purpose of this study was to examine the effect of visuals possessing different amounts of realistic detail and the effects of integrating covert and overt rehearsal strategies into visually complemented prose instruction.

Method

Arrangements

One hundred twenty-eight students at Penn State University were randomly assigned to four treatments. Students in each treatment received a 37-page instructional module of approximately 1800 words describing the physiology and functions of the human heart. Each page contained a 2 1/2 inch x 3 1/2 inch illustration of the human heart which was designed to illustrate the printed content contained on each frame. Simple line drawings complemented the instruction for students in Treatments 1 and 2; detailed line drawings were used to complement the instruction in Treatments 3 and 4. The simple line drawings were defined as possessing low amounts of realistic detail and the detailed line drawings as possessing greater amounts of realistic detail.

Each treatment was designed in the programmed instruction format. Each instructional frame contained a question on the bottom which asked the student whether the illustrations correctly illustrated the printed material it was designed to complement. Students in Treatments 1 and 3 re-

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sponded covertly (mentally) to the yes or no question, whereas students in Treatments 2 and 4 overtly recorded their responses on answer sheets. Visual reinforcement of the accuracy of their response to the printed questions was presented on the following page. Illustrations for feedback were labeled correct if the visual accurately portrayed the information being presented verbally. Visuals for feedback were labeled corrected if the visual on the previous page did not accurately portray the information being presented, and the "corrected visual" was the correct portrayal.

Criterion Measures

Students in each treatment received their respective instructional presentation and then completed four individual criterion tests. Scores on these tests were combined into an 80-item total criterion test. The objective of each test was as follows: (a) drawing test—to evaluate learning of specific locations of the various patterns, structures and positions of the parts of the heart, (b) identification test—to measure transfer of learning (i.e., the ability to identify numbered parts of a diagram of the heart from information received in the instruction), (c) terminology test—to evaluate students' knowledge of referents for specific symbols, (d) comprehension test—to measure understanding of the heart, its parts and internal operations, and (e) total criterion test— to measure the students' total understanding of the concepts presented.

Results and Discussion

Analyses indicated that when students received the covert and overt treatments (Treatment 1 versus Treatment 2) of the simple line drawings, significant differences in favor of the covert version (Treatment 1 > Treatment 2) were found to exist on the terminology ($t(1,62)=3.99$, $p. < .01$), comprehension ($t(1,62=7.06$, $p. < .01$), and total criterion tests ($t(1,62)=4.16$, $p. < .01$). In comparing the covert and overt treatments complemented by detailed line drawings, the covert treatment (Treatment 3) was significantly more effective than the overt treatment (Treatment 4) on all criterion measures (drawing, $t(1,61)=4.82$, $p. < .01$; identification, $t(1,62)=2.08$, $p. < .05$; terminology, $t(1,62)=2.26$, $p< .05$; comprehension, $t(1,62)=12.88$, $p. < .01$); total $t(1,62)=5.68$, $p. < .01$).

In comparing the results of student achievement attained as a result of receiving the covert simple line treatment (Treatment 1) and the covert detailed line drawing treatment (Treatment 3), students receiving the latter (Treatment 3) achieved significantly higher mean scores than students given the simple line Treatment (Treatment 1) on the identification ($t(1,58)=2.39$, $p. < .05$), comprehension ($t(1,58)=2.98$, $p. < .05$) and total criterion tests ($t(1,58)=2.06$, $p. < .05$). Insignificant differences in mean student achievement were found to exist on the terminology tests. In comparing the mean achievement of students receiving the overt versions of the line drawing (Treatment 2) and detailed drawing treatments (Treatment 4), insignificant differences were obtained on all criterion measures.

The results indicated that when students received the detailed drawing treatments, those who had the covert rehearsal achieved significantly higher mean scores on all criterion measures. The same pattern was found for students who received the line drawing treatment on the terminology, comprehension, and total criterion measures. When the achievement of students who received the line drawing and detailed

line drawing treatment, complemented by covert rehearsal was examined, those students who received the detailed line treatment achieved significantly higher mean scores than did students who received the line treatment. Insignificant differences in achievement on all criterion measures were found to exist on all criterion measures among students who received the simple and detailed line drawings complemented by overt rehearsal.

The superiority of the covert responses was unexpected since most of the related research (Dwyer,1978; Dwyer,1987) indicates that overt responses instigate deeper levels of information processing and thereby results in greater levels of information acquisition. The type of students who participated in this study may have influenced the outcome since they were of high ability in an academic curriculum and were more likely to use their own assimilative encoding strategies regardless of the topic or instructional manipulation imposed by the experimental treatments. It is possible that the process of recording their responses to questions interrupted the use of their already established formal learning strategies and hindered rather than facilitated information, acquisition and subsequent recall (Walko & Dwyer,1990). This interpretation seems to derive some support from prior research (Corey, 1955; Palmatien & McNich,1972) which showed that when students are involved in overt activity the process becomes a deterrent to learning.

When the covert versions of the line and detailed drawings were compared, the students who received the detailed line drawings achieved significantly higher mean scores on all criterion measures. These results are similar to previous findings (Dwyer,1978; Dwyer,1987) which indicate that when students are permitted to initiate their own learning strategies, the realistic detail (the detailed line drawing) which contains the greatest amount of instructional stimuli usually is most effective in facilitating optimum learning. This finding was not replicated when the overt versions of the line and detailed treatments were compared. No significant differences were found to exist between the two types of drawings on all criterion measures. One explanation for this finding may be that students in interacting with the detailed drawings only interacted with the basic visual structures in the detailed drawings to acquire the information necessary to respond to the questions. Consequently, they did not interact with the additional information in the detailed drawings to maximize information acquisition.

This study which examined the effect of covert and overt rehearsal strategies used to complement visualized instruction (possessing different amounts of realistic detail) raises a number of questions for further research: (a) what would be the results if high school rather than college students participated in the study, (b) would a profile of performance similar to this study be retained if, instead of immediate posttesting, a delayed test was administered two to three weeks later, and (c) would the profile of achievement on each criterion test be retained if visual rather than verbal tests were used to assess student achievement from the visually complemented instruction.

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